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Avian Cestodes of the Ivory Coast

JEAN MARIAUX
Institute of Zoology, University of Neuchâtel, Ch. de Chantemerle 22,
CH-2007 Neuchâtel, Switzerland

ABSTRACT: Between 1985 and 1988, the cestodes of 1,252 wild birds (174 species) from the Ivory Coast (West Africa) were collected and studied. Of these birds, 15.7% were parasitized by an estimated 95–100 species of tapeworms, 55 of them having been determined or described. Most of the parasites were found in new hosts, and numerous new geographical records are reported. In general, both the prevalence and intensity of infection were low. All the parasites were cyclophyllideans distributed mainly in the families Dilepididae, Hymenolepididae, and Paruterinidae. Of particular interest was the presence of 3 species of the family Metadilepididae in the collections.

KEY WORDS: Platyhelminthes, cestodes, birds, Ivory Coast, taxonomy, survey.

Avian cestode faunas in the Republic of the Ivory Coast (West Africa) have been poorly studied. Only 8 species of tapeworms have been reported from avian hosts in this region (Morel, 1959; Quentin, 1964; Baer, 1972), and recent investigations are lacking. The fauna of neighboring countries is not better known. With the exception of the parasites of some poultry or game birds such as *Numida* sp., virtually nothing is known on platyhelminths of wild birds in tropical Africa. The only noticeable exceptions are the works by Southwell and Lake (1939) and Mahon (1954), both in Zaire; however, these surveys were done in a country very distant from the Ivory Coast and concerned few species in common with those presented in this work. Consequently, I initiated a study of the avian tapeworm fauna of this region with the goal of developing an inventory of species diversity for these poorly known organisms in a region that has received little attention from parasitologists.

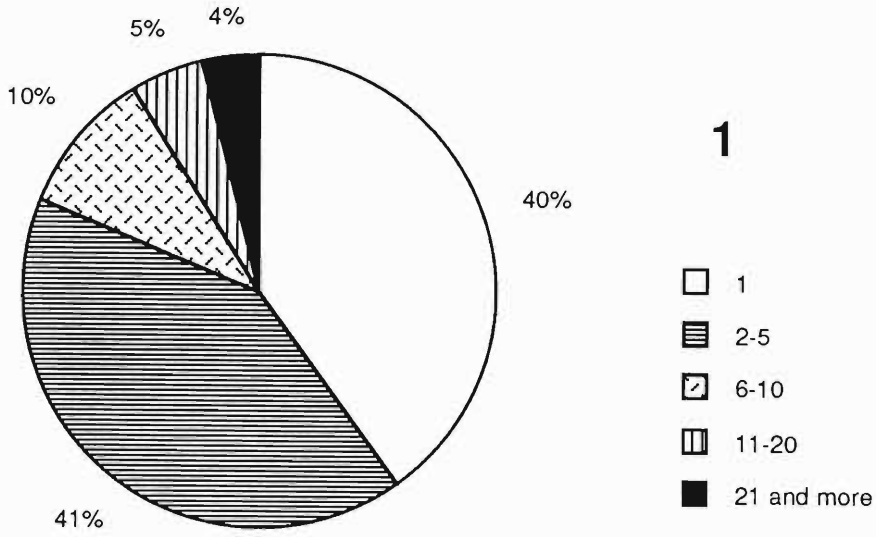
During 3 field seasons (each of 4 mo duration), in 1985, 1987, and 1988, I examined 1,252 birds, primarily representing the commonly occurring avian species of the Ivory Coast, with an emphasis on nonmigratory landbirds. Although collecting was concentrated in the southern areas of the country, fieldwork was widespread and included all biotopes existing in the region, extending from the southern rainforests and coastal zones to the northern savannahs. The systematics of some cestodes derived from these collections has been treated previously (Mariaux and Vaucher, 1988, 1989, 1990, 1991; Mariaux, 1989, 1991a, b; Mariaux and Georgiev, 1991; Mariaux et al., 1992). The present article summarizes the overall results of these collections and documents new information for host–parasite distribution of this poorly known avian cestode fauna.

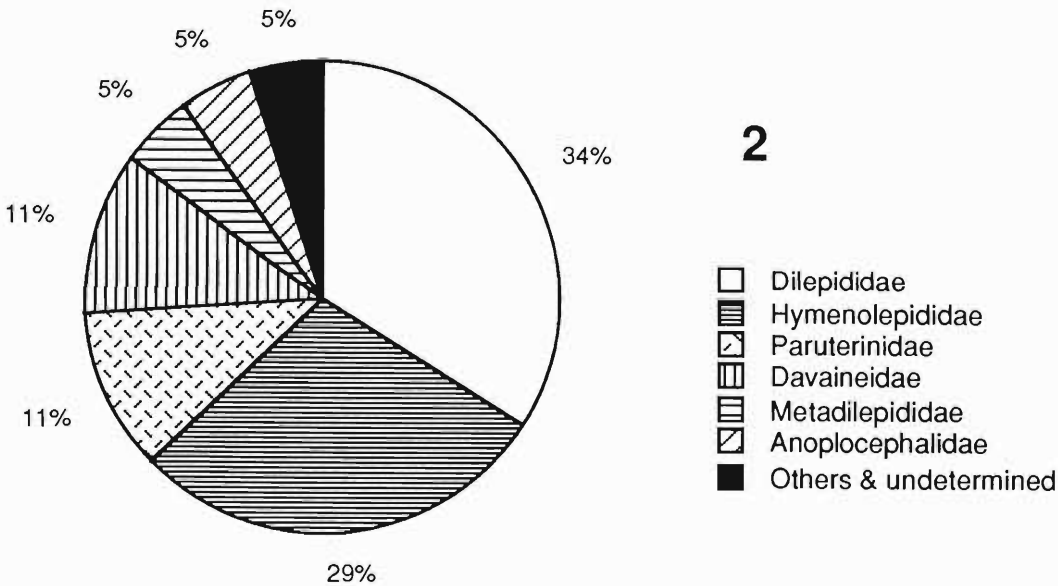
Materials and Methods

Methods were described in previous works (Mariaux and Vaucher, 1988, 1990). In summary, birds were captured with mist nets or shot. They were necropsied and examined for parasites immediately after death. Cestodes were removed from the dissected gut with forceps and fixed with hot 5% formalin. They were then transferred into 70% ethanol for long-term storage. The worms were stained with alcoholic hydrochloric carmine and mounted in Canada balsam for light or Nomarsky microscopy. Some specimens were also prepared for scanning electron microscopy. All the parasites studied and most of the hosts (skins and skeletons) have been deposited at the Muséum d'Histoire Naturelle de Genève (MHNG) in Geneva, Switzerland.

Results

The 1,252 birds studied belong to 174 species distributed in 104 genera and 39 families. One to 48 specimens ($\bar{x} = 6 \pm 0.6$) of each species were examined. The prevalence of infection by cestodes was highly variable by host family. Overall, 197, or 16%, of the birds were parasitized by tapeworms, but this value was as low as 0%, for example, in Alcedinidae (29 specimens examined) and Indicatoridae (14), 6% in Nectariniidae (129), and 8% in Ploceidae (182) and as high as 80% in Corvidae (10) and 56% in Cuculidae (9). The intensity of infection was rather low, with a clear predominance of parasitism by 1–5 specimens and extremely rare infections by more than 20 specimens (Fig. 1). Infections were usually due to a single species of parasites (98%), whereas only 23 mixed infections (22 double and 1 triple) were noted. At the familial level, the most important groups collected were the Dilepididae and Hymenolepi-





Figures 1, 2. 1. Intensities of tapeworm infection among 197 of 1,252 birds examined from the Ivory Coast (220 values). 2. Composition of the cestode fauna of 1,252 birds examined in the Ivory Coast by family (220 occurrences).

didae, followed by Paruterinidae and Davaineidae (Fig. 2). At this time, 55 taxa are determined to the generic or specific level, but the collection is estimated to be composed of about 95–100 distinct species.

In Table 1, a synoptic overview of these collections is presented with a complete host–parasite list based on the material that has been determined at least to the generic level. This list demonstrates how poorly known is this fauna: Among the records not previously published, there are 52 new host records. Furthermore, all records not treated in previous papers are new for the Ivory Coast, and 19 are new for West Africa or for the entire continent.

Discussion

The overall prevalence found in the present study (16%) was low as compared to that reported in similar works (e.g., 23% by Petrova [1978]; 26–44% by Rausch [1983]; 27% by Spasskaja and Spassky [1971]; 28% by Schmidt et al. [1985]; 33% by Ryšavý [1955]; 34% by Yun [1973]; 43% by Zhuk et al. [1982]; 18–69% by various authors, as reported by Rausch [1983]). However, in the only comprehensive work in tropical Africa that includes some numerical data, Southwell and Lake (1939) reported about 20% prevalence among parasitized birds (Mahon [1954], who worked in Zaire, did not report that kind of information). This is a remarkable coincidence even if it seems probable that the low observed prevalences in the present study and that of Southwell and Lake (1939) were more probably due to the composition of the avifauna than to geographical reasons (the other works mentioned here were mainly focused on birds from aquatic biotopes).

The species composition of the fauna from the Ivory Coast is particularly diverse and interesting. Although some of the cestodes have yet to be specifically determined, the diversity and the proportion of new material is relatively great. The most notable aspect of fauna structure was the relatively high proportion of worms belonging to the family Metadilepididae (Fig. 2). This family, originally erected by Spassky (1959) and reviewed by Spassky and Spasskaja (1977) and Kornyushin and Georgiev (in press), has largely been ignored by Western authors. Renewed interest in the family derived from the redescription of *Skrjabinoporus merops* by Mariaux and Vaucher (1989) and the subsequent descriptions of new members of the group (Mariaux, 1991a; Mariaux et al., 1992).

The parasite fauna of some families of hosts warrants some additional remarks with respect to diet and the distribution of cestodes. Species of the Alcedinidae (kingfishers) and Jacanidae (jacanas) have never been found infected, despite the examination of 29 and 6 specimens, respectively. This is rather surprising given the ecology and habitat of these birds. This point has been previously discussed for the Alcedinidae, and it was suggested that cestodes could be replaced by trematodes in these hosts (Mariaux and Vaucher, 1989). A similar explanation could perhaps be applicable to jacanas, because trematodes, but not cestodes, were present in my captures; however, the small number of individuals examined does not allow unequivocal support of this contention. Another family, the Nectariniidae (sunbirds), was parasitized by 3 distinct species of cestodes (Mariaux and Vaucher, 1991). This was in contrast to the very limited list of known cestodes of these birds and tended to suggest that the minute arthropods swallowed by the sunbirds when sucking nectar from flowers could serve as intermediate hosts. The Estrildidae, with more than 1 bird out of 4 parasitized by cestodes, also are infected more heavily than their diet would indicate. These examples (of insectivorous/carnivorous birds almost unparasitized and granivorous/nectarivorous birds with a diverse array of parasites) prevent us from formulating simplistic conclusions about the relationships between diet and parasitic fauna. Even if general trends exist—for example, aquatic birds are certainly more heavily infected by cestodes than terrestrial ones—exceptions do occur.

In comparison with Rausch's (1983) survey of bird helminths, it is worth noticing some other results of the present study. In contrast to the low prevalences reported by Rausch, both in the United States and in Eurasia, I observed a high prevalence of cestodes in Cuculidae. Five of the 9 specimens (5 species) I collected were parasitized with 3 different species of tapeworms. The same observation can be made about Meropidae. I studied 45 individuals belonging to 3 species, and 8 of them (18%) harbored cestodes. This was about twice as many as reported in Rausch's summary. In contrast, only 15% of the 32 individuals (5 species) of Hirundinidae I examined had cestodes. Rausch reported prevalences varying from 40 to 100% for these birds. Finally, I

Table 1. Host–parasite list ordered alphabetically by host.

Host family	Genus and species	Parasite family	Genus and species	Prevalence	Intensity	Status[a]	MHNG accession #
Accipitridae	*Accipiter badius*	Davaineidae	*Idiogenes flagellum*	1/1	1	*	987.245
Ardeidae	*Ardea purpurea*	Dilepididae	*Dendrouterina macrosphincter*	1/1	2	o1, 2	988.172
			Neogryporhynchus lasiopeius	1/1	215	●	988.171
	Butorides striatus	Dilepididae	*Valipora* sp.	1/3	45	*o2	988.170
		Hymenolepididae	*Drepanidotaenia* sp.	2/3	1	*	985.607; 988.169
Capitonidae	*Gymnobucco calvus*	Davaineidae	*Raillietina (P.) bargetzii*	1/2	8	P	987.230
		Hymenolepididae	*Thaumasiolepis microarmata*	2/2	2–4	P	987.228–9
	Lybius dubius	Hymenolepididae	*Thaumasiolepis microarmata*	4/4	2–11	P	987.225–7; 988.177
	Pogoniulus scolopaceus	Paruterinidae	*Paruterina* sp.	1/17	4	*	988.174
Charadriidae	*Charadrius hiaticula*	Hymenolepididae	*Wardium hughesi*	2/3	1–2	P	985.603–4
		Progynotaeniidae	*Progynotaenia odhneri*	3/3	6–27	P	985.601–2; 988.162
Columbidae	*Streptopelia semitorquata*	Davaineidae	*Raillietina* sp.	1/2	5		985.609
	Turtur afer	Anoplocephalidae	*Aporina delafondi*	1/22	1	*o1, 2, 3	987.247
		Davaineidae	*Raillietina* sp.	1/22	1		985.608
	T. tympanistria	Davaineidae	*Raillietina* sp.	1/9	2		987.248
Corvidae	*Corvus albus*	Davaineidae	*Raillietina (P.) reynoldsiae*	2/2	1–2	o2, 3	987.244; 988.173
	Malaconotus blanchoti	Paruterinidae	*Anonchotaenia (P.) malaconoti*	1/2	2	P	988.182; 988.184
	Prionops plumata	Dilepididae	*Anomotaenia* sp.	3/7	1–12	*	987.302–3; 988.416
		Paruterinidae	*Anonchotaenia (P.) prionopos*	3/7	4–6	P	987.251–3
Cuculidae	*Centropus leucogaster*	Davaineidae	*Raillietina (R.) permista*	1/1	9	*o2	988.166
	C. senegalensis	Davaineidae	*Raillietina (R.) macrocirrosa*	1/2	7		987.237
			Raillietina (R.) permista	1/2	7	*o2	988.165
	Ceuthmochares aereus	Dilepididae	*Bonaia africana*	1/1	100	P	988.163–4
	Chrysococcyx klaas	Davaineidae	*Raillietina (R.) permista*	1/1	1	*o2	985.606
Estrildidae	*Estrilda melpoda*	Davaineidae	*Raillietina (R.)* sp.	1/15	2	*	985.633
	Lonchura cucullata	Hymenolepididae	*Echinocotyle dolosa*	13/32	1–12		985.622; 985.624–7, 985.964; 987.278–84
	L. fringilloides	Hymenolepididae	*Echinocotyle dolosa*	1/3	17	*	985.623
	L. poensis	Hymenolepididae	*Echinocotyle dolosa*	1/1	1	*	987.277
	Pirenestes ostrinus	Davaineidae	*Raillietina* sp.	1/7	2		987.288
Glareolidae	*Glareola pratincola*	Hymenolepididae	*Wardium* sp.	2/2	1–3	*	988.175–6
Hirundinidae	*Hirundo rustica*	Hymenolepididae	*Passerilepis* sp.	1/5	1	*	988.418
		Paruterinidae	*Anonchotaenia* sp.	1/5	1		985.619
	H. semirufa	Paruterinidae	*Anonchotaenia longiovata*	1/14	10	P	987.254
			Anonchotaenia sp.	1/14	1		987.255
			Neyraia(?) sp.	1/14	8	P	987.238[b]
	Psadiloprocne obscura	Paruterinidae	*Anonchotaenia globata*	1/8	8	P	988.183
Incertae sedis	*Hylia prasina*	Davaineidae	*Raillietina* sp.	1/16	1	*	987.307

Table 1. Continued.

Host family	Genus and species	Parasite family	Genus and species	Prevalence	Intensity	Status[a]	MHNG accession #
Laniidae	*Tchagra senegalensis*	Dilepididae	*Anomotaenia* sp.	1/6	2	*	988.417
		Hymenolepididae	*Variolepis* sp.	2/6	4–5	*	988.412–3
		Paruterinidae	*Biuterina africana*	1/6	10		988.414
Meropidae	*Merops albicollis*	Metadilepididae	*Skrjabinoporus merops*	2/16	1–2	P	987.224; 988.178
		Paruterinidae	*Biuterina macrancistrota*	5/16	2–8	P	987.221–2; 988.179–81
	M. gularis	Metadilepididae	*Skrjabinoporus merops*	1/2	1	P	987.223
Motacillidae	*Anthus leucophrys*	Dilepididae	*Sobolevitaenia sobolevi*	6/19	1–25	*●	985.954–9
		Hymenolepididae	*Variolepis* sp.	4/19	1–3		985.960–1; 987.304; 988.419
	Macronyx croceus	Dilepididae	*Sobolevitaenia* sp.	1/3	9	*●	987.256
		Hymenolepididae	*Variolepis* sp.	1/3	1	*	987.257
Muscicapidae	*Batis senegalensis*	Dilepididae	*Anomotaenia* sp.	4/12	2–9	*	985.620–1; 987.305; 988.420
			Pseudochoanotaenia eburnea	1/12	2	*	987.306
	Platysteira blisseti	Paruterinidae	*Sphaeruterina* sp.	1/3	1	*●	987.262
	P. castanea	Dilepididae	*Anomotaenia* sp.	1/11	2	*	988.185
	Terpsiphone rufiventer	Hymenolepididae	*Passerilepis* sp.	1/11	3	*	987.261
		Metadilepididae	*Pseudadelphoscolex eburnensis*	3/11	1	P	987.258–60
	Anthreptes fraseri	Dilepididae	*Emberizotaenia* sp.	1/3	1	*	988.411
Nectariniidae	*Nectarinia chloropygia*	Hymenolepididae	*Staphylepis ambilateralis*	1/6	1	P	985.614
	N. cuprea	Hymenolepididae	*Staphylepis ambilateralis*	2/6	1	P	985.612; 985.615
	N. cyanolaema	Hymenolepididae	*Staphylepis ambilateralis*	1/1	2	P	985.617
	N. olivacea	Hymenolepididae	*Staphylepis ambilateralis*	1/38	2	P	985.613
	Nectarinia sp.	Hymenolepididae	*Staphylepis ambilateralis*	2/23	1–2	P	985.610–1; 985.616
Oriolidae	*Oriolus brachyrhynchus*	Davaineidae	*Raillietina* sp.	1/2	11	*	987.246
Paridae	*Melaniparus niger*	Davaineidae	*Raillietina* sp.	1/2	1	*	988.407
Phalacrocoracidae	*Phalacrocorax africanus*	Dilepididae	*Paradilepis delachauxi*	1/1	2		988.415
Picidae	*Campethera caroli*	Davaineidae	*Raillietina* (*S.*) *campetherae*	1/1	1	P	987.233
	C. nivosa	Davaineidae	*Raillietina* (*S.*) *campetherae*	1/1	4	P	987.231–2
		Davaineidae	*Raillietina* (*P.*) *yapoensis*	1/1	4	P	987.234–5
Ploceidae	*Euplectes macrourus*	Paruterinidae	*Paruterina* sp.	1/18	1	*	985.628
	Petronia dentata	Dilepididae	*Anomotaenia* sp.	2/17	2	*	987.275–6
		Paruterinidae	*Biuterina* sp.	1/17	11	*	988.186
	Plocepasser superciliosus	Paruterinidae	*Sphaeruterina* sp.	1/6	1	*●	988.187
	P. nigerrimus	Dilepididae	*Anomotaenia* sp.	3/27	1–2	*	985.632; 985.637; 988.402
	P. nigricollis	Dilepididae	*Anomotaenia* sp.	1/16	2	*	987.290
Pycnonotidae	*Andropadus latirostris*	Anoplocephalidae	*Paronia calcaruterina*	2/21	1	*●	985.292–3

Table 1. Continued.

Host family	Genus and species	Parasite family	Genus and species	Prevalence	Intensity	Status[a]	MHNG accession #
	A. virens	Anoplocephalidae	*Paronia calcaruterina*	3/48	1–2	*●	985.639; 987.291; 987.294
		Hymenolepididae	*Passerilepis passeris*	3/48	1–6	*	985.947–9
	Bleda canicapilla	Incertae sedis	*Spreotaenia abassenae*	1/16	1	*○3	985.962
	Chlorocichla simplex	Davaineidae	*Raillietina* sp.	1/15	1	*	985.946
	Criniger barbatus	Hymenolepididae	*Passerilepis* sp.	1/3	2	*	987.297
	C. calurus	Davaineidae	*Raillietina* sp.	1/3	5	*	987.295
		Hymenolepididae	*Passerilepis* sp.	2/3	1–7	*	987.298–9
	Phyllastrephus icterinus	Metadilepididae	*Yapolepis yapolepis*	5/19	1–5	P	987.239–42; 988.167–8
	Pycnonotus barbatus	Anoplocephalidae	*Paronia calcaruterina*	5/34	1–2	*●	985.638; 985.640; 985.943–5
		Dilepididae	*Emberizotaenia* sp.	6/34	1–5	*	985.965–70
Scolopacidae	*Tringa hypoleucos*	Dilepididae	*Anomotaenia hypoleuci*	4/12	2–20	P	985.595–9
			Kowalewskiella cingulifera	4/12	1–9	P	985.592–4; 987.236
		Davaineidae	*Raillietina permista*	1/12	1	P	985.600
Sylviidae	*Acrocephalus arundinaceus*	Paruterinidae	*Paruterina* sp.	2/9	2	*	987.273–4
	Camaroptera brachyura	Dilepididae	*Pseudochoanotaenia eburnea*	1/21	1	*	985.963
	Cisticola cantans	Dilepididae	*Pseudochoanotaenia eburnea*	1/1	1	P	985.583
	C. erythrops	Dilepididae	*Pseudochoanotaenia eburnea*	1/2	2	P	985.590
	C. galactotes	Dilepididae	*Pseudochoanotaenia eburnea*	2/2	3–8	P	985.581–2; 985.584
	C. lateralis	Dilepididae	*Pseudochoanotaenia eburnea*	3/3	1	P	985.586–7
	C. natalensis	Dilepididae	*Pseudochoanotaenia eburnea*	1/1	1	P	985.588
	Cisticola sp.	Dilepididae	*Pseudochoanotaenia eburnea*	10/87	1–6	P	985.585; 985.589; 985.591; 985.618; 987.264–70
		Hymenolepididae	*Variolepis* sp.	1/87	1	*	987.272
	Sylvietta virens	Paruterinidae	*Biuterina* sp.	1/7	3	*	987.271
Timallidae	*Malacocincla cleaveri*	Hymenolepididae	*Passerilepis* sp.	1/1	1	*	987.300
	Turdoides plebejus	Hymenolepididae	*Variolepis farciminosa*	1/3	3	*●	988.410
Turdidae	*Turdus pelios*	Dilepididae	*Emberizotaenia* sp.	4/13	2–10	*	988.421–4
		Hymenolepididae	*Variolepis fernandensis*	3/13	2–4	*●	988.403–5
Turnicidae	*Turnix sylvatica*	Davaineidae	*Raillietina* sp.	2/6	1–65	●	987.249–50

[a] * = new host record; ● = new African record; ○ = new West African record (1, already known from Northern Africa; 2, Central Africa; 3, Eastern Africa); P = published in previous works by the same author.

[b] Part of this material is deposited at the Central Laboratory for Helminthology in Sofia (Bulgaria) with the accession number 1989.12.27.1.

found only 4 out of 42 Columbidae with tapeworms. This is comparable to Rausch's findings in the United States and in sharp contrast to the much higher prevalences (30–46%) he reported from works done in Eurasia.

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